

thirty feet across. It comes fresh out of the ground and is not more than 100 yards behind a mangrove swamp on level ground in the jungle. In this spring at least twenty-eight species of freshwater snails were collected in two hours. With thorough collecting it is possible that the spring would perhaps yield a dozen more species of shells. Many of the species taken from the spring were not found elsewhere and seem to be highly localized while others have a wide distribution.

THE GASTROPOD FAUNA OF THE INTERTIDAL ZONE AT MOSS BEACH, SAN MATEO COUNTY, CALIFORNIA

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The gastropod fauna here listed was collected during a five weeks' period involving the latter part of the month of June and the month of July, 1933. A total of 126 species are represented in the collection, 21 of which are reported from beyond the previously known range of the species.

The intertidal zone at Moss Beach, consists of a series of truncated strata of fine grained, black, sandstones of Pliocene age, striking at an angle from the shore, so that at low tide an area almost 300 feet wide is exposed on which are developed a large number of tide pools protected from the action of the waves by the edges of the strata which dip toward the sea. The region from which the collections were made lies southward from the town of Moss Beach to Pillar Point, a distance of approximately three miles. Pillar Point marks the northern limit of Halfmoon Bay, a down-faulted block which being low lying, has a sandy bottom and supports an entirely different faunal assemblage from that found at Moss Beach.

In the following check-list species represented in the collection which occur only at Pillar Point and probably have been washed up by wave action from the sands of Halfmoon Bay are indicated by a dagger (†) and the forms represented in the collections from all points by empty shells only are indicated by an asterisk (*). The gastropod species found are:

- Haminoea vesicula* (Gould), 1855
Gadinia reticulata (Sowerby), 1835
Arctonchis borealis (Dall), 1871
Conus californicus Hinds, 1844
†**Clathrodrillia* (*Moniliopsis*) *incisa* (Carpenter), 1865
†**Clathrodrillia* (*Moniliopsis*) *incisa* var. *ophioderma* (Dall), 1908
†**Pseudomelatoma torosa* (Carpenter), 1865
Mangelia (*Bela*) *variegata* Carpenter, 1864
†**Olivella biplicata* Sowerby, 1825
Cypraeolina pyriformis (Carpenter), 1865
†**Mitra idae* Melvill, 1893
Searlesia dira (Reeve), 1846
†**Nassarius* (*Schizopyga*) *fossatus* (Gould), 1843
Nassarius (*Schizopyga*) *cooperi* (Forbes), 1850
Mitrella carinata (Hinds), 1844
Mitrella carinata var. *gausapata* (Gould), 1851
Mitrella gouldii (Carpenter), 1857
Mitrella tuberosa (Carpenter), 1864
Amphissa columbiana Dall, 1916
Amphissa versicolor, 1871
Amphissa bicolor Dall, 1892
Purpura foliata Martyn, 1784
Tritonalia lurida (Middendorff), 1849
Tritonalia lurida var. *aspera* (Baird), 1863
Tritonalia lurida var. *munda* (Carpenter), 1864
Tritonalia lurida var. *rotunda* Dall, 1919
**Tritonalia painei* Dall, 1903
Tritonalia circumtexta (Stearns), 1871
Tritonalia interfossa (Carpenter), 1864
Tritonalia interfossa var. *atropurpurea* (Carpenter MS) Dall, 1919
Tritonalia foveolata (Hinds), 1843
**Tritonalia subangulata* (Stearns), 1873
Thais (*Nucella*) *lamellosa* (Gmelin), 1792
Thais (*Nucella*) *lima* (Martyn), 1784
Thais (*Nucella*) *canaliculata* (Duclos), 1832
Thais (*Nucella*) *emarginata* (Deshayes), 1839
Thais (*Nucella*) *emarginata* var. *ostrina* (Gould), 1852
Acanthina (*Acanthinucella*) *spirata* (Blainville), 1832
**Epitonium* (*Opalia*) *wroblewskii* (Morch), 1876
Epitonium (*Nitidiscala*) *crebricostatum* (Carpenter), 1866
Epitonium (*Nitidiscala*) *indianorum* (Carpenter), 1865
Epitonium (*Nitidiscala*) *tinctum* (Carpenter), 1865
**Turbonilla* sp. indet.
Odostomia (*Chrysallida*) *astricta* Dall and Bartsch, 1907

- Odostomia (Chrysallida) oregonensis* Dall and Bartsch, 1907
Odostomia (Chrysallida) n. sp.
Odostomia (Iolaea) amianta Dall and Bartsch, 1907
Odostomia (Evalea) tenuisculpta Carpenter, 1864
Odostomia (Evalea) valdezi Dall and Bartsch, 1907
Odostomia (Evalea) sp. cf. *io* Dall and Bartsch, 1903
Odostomia (Evalea) n. sp.
Odostomia (Amaura) moratora Dall and Bartsch, 1909
 **Trivia californiana* (Gray), 1828
Erato vitellina Hinds, 1844
Cerithiopsis (Cerithiopsidella) cosmia Bartsch, 1907
Bittium (Stylidium) eschrichtii (Middendorff) var. *monterey-ense* Bartsch, 1907
Bivonia compacta Carpenter, 1864
Spiroglyphus lituellus (Morch), 1861
Littorina planaxis Nuttall in Philippi, 1847
Littorina (Melarhaphé) scutulata Gould, 1849
Lacuna porrecta Carpenter, 1864
Lacuna solidula Loven var. *carinata* Gould, 1846
Lacuna variegata Carpenter, 1864
Lacuna marmorata Dall, 1919
 **Iselica fenestrata* (Carpenter), 1864
Diala acuta Carpenter, 1864
Barleeia haliotiphila Carpenter, 1864
Barleeia oldroydi Bartsch, 1920
Cingula montereyensis Bartsch, 1912
Cingula californica Tryon, 1865
Alvania compacta Carpenter, 1865
Alvania n. sp. A
Alvania n. sp. B
Hipponyx serratus Carpenter, 1857
Hipponyx antiquatus (Linnaeus), 1767
Crepidula convex Say, 1822
Crepidula adunca Sowerby, 1825
Crepidula exuviata Nuttall, 1859
Crepidula nivea C. B. Adams, 1852
Crepidula (Crepipatella) lingulata Gould, 1846
 †**Polinices (Euspira) lewisi* (Gould), 1847
 †**Polinices (Euspira) draconis* Dall, 1903
Lamellaria rhombica Dall, 1871
Velutina laevigata (Linnaeus), 1767
Acmaea mitra Eschscholtz, 1833
Acmaea pelta Eschscholtz, 1833
Acmaea scutum Eschscholtz, 1833
Acmaea ochracea Dall, 1871
Acmaea digitalis Eschscholtz, 1833

- Acmaea limatula* Carpenter, 1866
Acmaea scabra (Gould), 1846
Acmaea persona Eschscholtz, 1833
Acmaea instabilis Gould, 1846
Acmaea incessa (Hinds), 1842
Acmaea asmi (Middendorff), 1849
Acmaea palacea Gould, 1851
Acmaea cribraria (Gould MS) Carpenter, 1834
Lottia gigantea Gray, 1834
Tricolia compta (Gould), 1855
Tricolia pulloides (Carpenter), 1865
**Astraea (Pachypoma) inaequalis* (Martyn), 1784
Homalopoma carpenteri (Pilsbry), 1888
Homalopoma bacula (Carpenter), 1864
Tegula (Chlorostoma) funebris (A. Adams), 1854
Tegula (Chlorostoma) brunnea (Philippi), 1848
Tegula (Chlorostoma) montereyi (Keiner), 1850
**Tegula (Promartynia) pulligo* (Martyn), 1784
**Tegula (Omphalius) ligulata* (Menke), 1850
Calliostoma costatum (Martyn), 1784
Calliostoma costatum var. *caeruleum* Dall, 1919
Calliostoma costatum var. *pictum* Dall, 1919
Calliostoma canaliculatum (Martyn), 1784
†**Calliostoma tricolor* Gabb, 1865
Margarites (Pupillaria) pupillus (Gould), 1849
Margarites (Pupillaria) salmonea Carpenter, 1864
Margarites (Lirularia) lirulatus (Carpenter), 1864
Margarites (Lirularia) succincta (Carpenter), 1864
**Haliotis cracherodii* Leach, 1817
Haliotis rufescens Swainson, 1822
Megatebennus bimaculatus (Dall), 1871
Megatebennus sp.
Diadora aspera (Escholtz), 1833

The occurrence at Moss Beach of several of these species is beyond their previously reported range. The majority of these forms have not heretofore been reported north of the vicinity of Monterey, California; those species in the following list indicated with an asterisk not being reported outside of Monterey Bay in the past. Included in the species for which the Moss Beach occurrence represents a new northern limit are:

- Pseudomelatoma torosa* (Carpenter), 1865
Mangelia (Bela) *variegata* Carpenter, 1864
Tritonalia foveolata (Hinds), 1834

- Tritonalia subangulata* (Stearns), 1873
Epitonium (Nitidiscala) tinctum (Carpenter), 1865
 **Odostomia (Chrysallida) astricta* Dall and Bartsch, 1907
Odostomia (Iolaea) amianta Dall and Bartsch, 1907
 **Odostomia (Evalea) valdezi* Dall and Bartsch, 1907
Cerithiopsis (Cerithiopsidella), cosmia Bartsch, 1907
Diala acuta Carpenter, 1864
 **Cingula montereyensis* Bartsch, 1912
Hipponix serratus Carpenter, 1857
 **Acmaea ochracea* Dall, 1871
Tricolia compta (Gould), 1855
Tricolia pulloides (Carpenter), 1865
Tegula (Omphalius) ligulata (Menke), 1850
Calliostoma tricolor Gabb, 1865
 **Margarites (Pupillaria) salmonea* Carpenter, 1864

In so far as the writer is aware, the presence of *Crepidula convexa* Say in the collections from Moss Beach, represents the first record of the occurrence of this species in the waters of the Pacific Ocean proper, though it has been part of the fauna of San Francisco Bay for some time. The migration of this species will be commented upon in a forthcoming paper.

New southern limits are indicated for the range of two species. Of these, *Odostomia (Amaura) moratora* Dall and Bartsch, 1909, has not been reported from any locality other than at Point Reyes, from where it was described; and *Alvana compta* Carpenter, 1865, has not been collected south of Trinidad, California.

The number of species reported beyond their previously known range is not remarkable when one considers the fact that the great majority of studies of the California molluscan faunas have been made at a very few localities. San Diego, San Pedro, Santa Barbara, Monterey, and to a lesser extent Newport, Catalina Island, Farallones, Bodega Bay, Fort Bragg and Trinidad represent the areas from which nearly all our collections have been made, and the faunas of the intervening areas are as yet practically unknown.